Toxicology Rounds

The Case of the Contaminated Coffee Pot

By Leon Gussow, MD

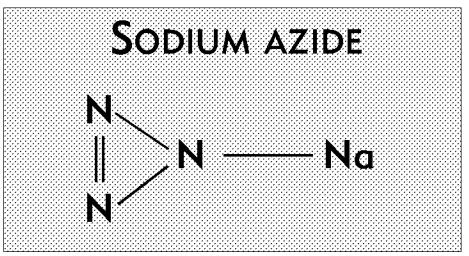
It seemed to be a blow struck at the very heart of science.

Let me explain. One workable definition of the term "research laboratory" could be "a complex mechanism designed to turn coffee into grant proposals and journal articles." So it was especially distressing when last August six workers in the New Research Building at Harvard Medical School fell sick after drinking from a communal coffee pot tainted with sodium azide. Within minutes of ingesting the java, the researchers experienced palpitations and became dizzy and diaphoretic. Two passed out. Some were taken to the hospital. Fortunately, the symptoms resolved spontaneously, and all victims recovered completely and rapidly.

When word of this episode got out several months later, the media were abuzz with conspiracy theories and murder plots. At least some of the victims thought that the contamination was deliberate. One local toxicologist told the *Boston Herald*: "An accident? Sodium azide is a poison. Absolutely not." The police were brought in to investigate, and security measures at all Harvard labs were tightened.

Attempted murder at a leading medical school makes one hell of a news story, but is that actually what happened in this case? Let's review the toxicology of sodium azide so that we can intelligently handicap the possibilities.

Sodium azide is a colorless, odorless crystal that is highly soluble in water. It is a direct vasodilator (possibly because it produces nitric oxide), and causes immediate hypotension after ingestion. (In fact, it has been used in the past to treat hypertension.) It is also a cellular poison, inhibiting cytochrome oxidase and interfering with energy generation in mitochondria. In this respect, it is somewhat similar to cyanide. In addition, sodium azide may increase excitation in the central nervous system, again via nitric oxide. When sodium azide interacts with stomach contents, it forms hydrazoic acid, a gas that causes virtually the same toxicity as azide itself. This gas represents a risk to medical personnel treating poisoned victims. But that's not all. This gas will be present in victims' exhalations and eructations, and represents a risk to medical personnel treating poisoned victims.



Common clinical effects of low-dose exposure to sodium azide include hypotension, tachycardia, headache, dizziness, and even syncope. Nausea, vomiting, and diarrhea can also occur. If the amount of toxin ingested is not great, these signs and symptoms resolve completely over several hours. Greater amounts of sodium azide, however, cause delayed severe manifestations, including hypotension refractory to fluids or pressors, metabolic acidosis, coma, seizures, dysrhythmias, and cardiac arrest.

Severe sodium azide poisoning is very difficult to treat. The traditional antidotes for cyanide toxicity — nitrites and sodium thiosulfate — do not appear effective. Although some papers suggest that hydroxocobalamin might be beneficial, its mechanism of action is so specific to cyanide that I remain doubtful. As an illustration of how resistant the toxin is to most imaginable therapies, one patient described by Albertson et al ingested a quarter-bottle of sodium azide crystals along with vodka, and died 30 hours after hospital admission despite being treated with gastric lavage, activated charcoal, exchange transfusion, charcoal hemoperfusion, and hemodialysis. (*J Toxicol Clin Toxicol* 1986;24[4]:339.)

In the cases of sodium azide toxicity reported in the medical literature, hypotension occurring more than one hour after ingestion or persisting for more than one hour turned out to be an ominous prognostic sign. Good supportive therapy seems the most reasonable treatment option, while paying attention to the need to protect the medical team from secondary exposure. In one fascinating case report, emergency staff attending to a man who ingested a large amount of sodium azide developed headaches, light-headedness and nausea. A few became so symptomatic they had to be relieved, and the remaining members of the team worked in five- or 10-minute shifts to avoid prolonged exposure. (*Ann Emerg Med* 1987; 16[12]:1378.)

Sodium azide has been used to manufacture automobile airbags and in the explosives industry. It is recommended that sodium azide not be disposed down a sink drain because it can react with the lead in plumbing to form the very explosive compound lead azide. But it is also — and this was not emphasized enough in the news coverage of the Harvard incident — quite commonly found in medical and research laboratories where it is used as a preservative and antibacterial medium in reagents, buffer solutions, and diluents.

The majority of reported sodium azide toxicity cases involved inadvertent exposures among laboratory workers. This is not to say that such exposures are trivial; the mortality rate of these reported accidental lab exposures was approximately 20 percent. The point is that these accidents are not uncommon. Solutions treated with sodium azide can be clear and odorless and easily mistaken for water. Because the amount of sodium azide that contaminated the coffee at Harvard seems minimal — the clinical manifestations rapidly resolved — it appears to me that by far the most likely explanation is a lab accident. When you hear hoofbeats, think horses, not zebras. When you see mild sodium azide exposure in a laboratory, don't think attempted mass murder. Admittedly, the final word on what caused this incident is not in yet; the police and OSHA are investigating.

Of the handful of case reports concerning sodium azide toxicity, one is especially tragic. Howard et al described a 29-year-old college student who as part of a laboratory experiment on kidney function ingested 700-800 cc of sodium azide solution which had been mistakenly labeled as normal saline. She experienced immediate nausea and confusion, followed by vomiting and diarrhea. When symptoms persisted, she was admitted for observation and then discharged from the hospital. During a second admission, she developed cardiac dysrhythmias and congestive heart failure, and died three-and-a-half days after ingestion. Autopsy revealed toxic cardiomyopathy. (*J Forensic Sci* 1990;35[1]:193.) This ability to cause severe delayed toxicity is one important way in which sodium azide toxicity seems to differ from cyanide.

In another case was reported, a graduate student at Kansas University was admitted to Lawrence Memorial Hospital with what were initially described as life-threatening injuries after accidentally ingesting sodium azide in a school laboratory. Published details about the incident are scant, but the student was discharged from the hospital after three days in intensive care.

My guess is that it probably was not deliberate poisoning at Harvard. But if I'm proved wrong when the final reports come out, it will be a much more interesting story. Agatha Christie would have been fascinated.

Signs and Symptoms of Sodium Azide Toxicity

Low-Dose Exposure	High-Dose Exposure
⊠ Headache	⊠ Refractory hypotension
⊠ Dizziness	⊠ Metabolic acidosis
⊠ Nausea	⊠ Coma
⊠ Vomiting	⊠ Seizures
⊠ Hypotension	⊠ Cardiopulmonary arrest
⊠ Faintness	
⊠ Syncope	

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